

What is claimed is:

1. An etching method for performing a plasma etching process on an etching target film formed on an object to be processed in an airtight processing chamber by generating a plasma of a processing gas introduced into the processing chamber by using a resist as a mask, the resist including an alicyclic acrylate resin, an alicyclic methacrylate resin, or a combination thereof,
5 wherein the plasma etching process is performed while maintaining a surface temperature of the object under a temperature condition of about 20°C or less.
- 10 2. The etching method of claim 1, wherein the plasma etching process is performed while maintaining a surface temperature of the object under a temperature condition of about 0°C or less.
- 15 3. The etching method of claim 1, wherein the etching target film is a low-k insulating film containing silicon (Si), oxygen (O) and carbon (C) atoms.
- 20 4. The etching method of claim 1, wherein the surface temperature of the object to be processed is lowered by using a heat dissipation mechanism.

5. The etching method of claim 4, wherein the heat dissipation mechanism includes a cooling unit for cooling the object to be processed by a coolant, and the surface temperature of the object to be processed is controlled at 5 about 20°C or less by lowering a temperature of the coolant.

6. The etching method of claim 4, wherein the heat dissipation mechanism includes an adsorptive holding unit for adsorptively holding the object to be processed, and the 10 surface temperature of the object to be processed is lowered by enhancing an adsorptive power of the adsorptive holding unit.

7. The etching method of claim 6, wherein the adsorptive 15 power is enhanced by finishing a surface of the object to be processed to be of a mirror surface, the surface being in contact with the adsorptive holding unit.

8. The etching method of claim 6, wherein the adsorptive 20 power is enhanced by adopting a material of the adsorptive holding unit to allow an amount of leakage current flowing therethrough to be controlled under the temperature condition.

25 9. The etching method of claim 1, wherein the surface temperature of the object is lowered by a heat sink

mechanism.

10. The etching method of claim 9, wherein surface temperature lowering of the object by the heat sink 5 mechanism is carried out by controlling a high frequency power applied to an electrode disposed in the processing chamber to generate a plasma and a pressure of a backgas supplied to a backside of the object.

10 11. An etching apparatus for performing a plasma etching process on an etching target film formed on an object to be processed in an airtight processing chamber by generating a plasma of a processing gas introduced into the processing chamber by using a resist as a mask, the resist including an 15 alicyclic acrylate resin, an alicyclic methacrylate resin, or a combination thereof,

wherein the plasma etching process is performed while maintaining a surface temperature of the object under a temperature condition of about 20°C or less.

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12. The etching apparatus of claim 11, wherein the plasma etching process is performed while maintaining a surface temperature of the object under a temperature condition of about 0°C or less.

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13. The etching apparatus of claim 11, wherein the etching

target film is a low-k insulating film containing silicon (Si), oxygen (O) and carbon (C) atoms.

14. The etching apparatus of claim 11, wherein the surface 5 temperature of the object to be processed is lowered by using a heat dissipation mechanism.

15. The etching apparatus of claim 14, wherein the heat dissipation mechanism includes a cooling unit for cooling 10 the object to be processed by a coolant, and the surface temperature of the object to be processed is controlled at about 20°C or less by lowering a temperature of the coolant.

16. The etching apparatus of claim 14, wherein the heat 15 dissipation mechanism includes an adsorptive holding unit for adsorptively holding the object to be processed, and the surface temperature of the object to be processed is lowered by enhancing an adsorptive power of the adsorptive holding unit.

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17. The etching apparatus of claim 16, wherein the adsorptive power is enhanced by finishing a surface of the object to be processed to be of a mirror surface, the surface being in contact with the adsorptive holding unit.

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18. The etching apparatus of claim 16, wherein the

adsorptive power is enhanced by adopting a material of the adsorptive holding unit to allow an amount of leakage current flowing therethrough to be controlled under the temperature condition.

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19. The etching apparatus of claim 11, wherein the surface temperature of the object is lowered by a heat sink mechanism.

10 20. The etching apparatus of claim 19, wherein surface temperature lowering of the object by the heat sink mechanism is carried out by controlling a high frequency power applied to an electrode disposed in the processing chamber to generate a plasma and a pressure of a backgas
15 supplied to a backside of the object.

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